



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
OSB2000-0289

December 13, 2000

Mr. Lawrence C. Evans
U.S. Army Corps of Engineers
Portland District, CENWP-CO-GP
P.O. Box 2946
Portland, Oregon 97208-2946

Re: Section 7 Formal Consultation and Essential Fish Habitat Consultation for Bridge Replacement Projects - 1st and 12th Avenues, City of Seaside, Clatsop County, Oregon (Corps No. 2000-00929)

Dear Mr. Evans:

Enclosed is the biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act (ESA) for the City of Seaside's Bridge Replacement Projects at 1st and 12th Avenues. The NMFS concludes in this Opinion that the proposed action is not likely to jeopardize Oregon Coast coho salmon (*Oncorhynchus kisutch*) or destroy or adversely modify critical habitat. Pursuant to section 7 of the ESA, NMFS has included reasonable and prudent measures with non-discretionary terms and conditions that NMFS believes are necessary and appropriate to minimize the potential for incidental take associated with this project.

This Opinion also serves as consultation on Essential Fish Habitat pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and its implementing regulations (50 CFR Part 600).

Questions regarding this letter should be directed to Rob Markle of my staff in the Oregon State Branch Office at (503) 230-5419.

Sincerely,

Michael R. Crouse

Donna Darm
Acting Regional Administrator



Endangered Species Act Section 7 Consultation
&
Essential Fish Habitat Consultation

Biological Opinion

Bridge Replacement Projects - 1st and 12th Avenues, Corps No. 2000-00929,
City of Seaside, Clatsop County, Oregon

Agency: U.S. Army Corps of Engineers, Portland District

Consultation Conducted By: National Marine Fisheries Service,
Northwest Region

Date Issued: December 13, 2000

Refer to: OSB2000-0289

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I. BACKGROUND

The U.S. Army Corps of Engineers (Corps) requested formal consultation on two proposed bridge replacement actions in the City of Seaside in a letter dated October 5, 2000. The National Marine Fisheries Service (NMFS) received the request for consultation and supporting information describing the proposed action on October 10, 2000. NMFS requested additional information on October 20, 2000. Additional information was provided and NMFS considered the information adequate to evaluate project effects on November 11, 2000. The City of Seaside (City) is the applicant for the subject permit. The project consultant is OBEC Consulting Engineers of Eugene, Oregon. The construction contract has been awarded to Carter and Company of Salem, Oregon.

The City of Seaside is a coastal community located along the Highway 101 corridor with a population of approximately 6,000. Tourism constitutes the area's primary source of income. The 1st Avenue Bridge is one of six bridges that cross the Necanicum River. These bridges are considered vital thoroughfares connecting the Highway 101 corridor to both oceanfront properties and the business district of Seaside. The 12th Avenue Bridge is one of three bridges that cross Neawanna Creek. The bridge connects residential areas to Seaside's business district and the Highway 101 corridor. The 1st Avenue and 12th Avenue Bridges were built in 1960 and are both exhibiting structural deficiency and decay.

This biological opinion (Opinion) considers the potential effects of the proposed action on Oregon Coast (OC) coho salmon (*Oncorhynchus kisutch*), which occur in the proposed project area. OC coho salmon were listed as threatened under the Endangered Species Act (ESA) on August 10, 1998 (63 FR 42587). Critical habitat was designated on February 16, 2000 (65 FR 7764) and protective regulations were issued under section 4(d) of the ESA on July 10, 2000 (65 FR 42423). NMFS concludes that the proposed action is not likely to jeopardize the subject species, or destroy or adversely modify designated critical habitat. Included in this Opinion is an incidental take statement with terms and conditions to minimize the take of the subject species. This consultation is conducted pursuant to section 7(a)(2) of the ESA and its implementing regulations, 50 CFR 402.

II. PROPOSED ACTIONS

A. Common to Both Actions

The proposed actions will replace the existing seven-span, concrete and timber bridges with three-span, concrete and steel pile structures. Both actions will involve work within, above, and adjacent to the respective waterways, including structure demolition and reconstruction, pile extraction and driving,

and boardwalk modification. Alignments will remain identical to the existing structures, though structure widths will increase approximately 12 feet. Bridge designs will incorporate stormwater treatment.

The ODFW recommended work period is from November 1 to February 15. This period is primarily in consideration of estuarine species and conflicts with coho salmon escapement timing. To minimize exposure to returning adult coho salmon, in-water work will be restricted to a January 1 to February 15 work period. This restriction applies to the removal of the existing bridge, removal of existing bridge piles, driving new bridge piles and sheet pile, and driving temporary utility support structure piles at the 12th Avenue Bridge.

Prior to bridge removal, holes will be cut into the bridge deck and galvanized steel-pipe pile driven for the new bridge piers, two piers per bridge consisting of eight piles each. Any pile driving done in the wet will occur within a sediment containment barrier. No pre-boring or jetting will occur. The steel-pipe pile will be filled with concrete following pile driving. A total of 32 steel-pipe piles will be driven for each structure (16 abutment piles and 16 pier piles).

Bridge removal will take place in segments. The bridge deck will be cut into pieces and craned off the support structure. Creosote treated wood piles will be extracted via vibratory method from equipment operating on the bridge as deck removal progresses. Any pile extraction done in the wet will occur within a sediment containment barrier. Clean sand collars (approximately 0.44 cubic yards per pile) will be placed around the base of each pile removed to minimize suspension of polycyclic aromatic hydrocarbons (PAH) contaminated sediments. No jetting will occur.

The contractor will use non-motorized, light weight, "Flexi-float" barges (7 ft x 35 ft) for containment. Two or three barges will be moored together to provide containment beneath bridge spans under demolition and construction. No petroleum products will be placed on the barges. The barges will be in place prior to the commencement of any over water construction operations. They are expected to be in the water from December 15, 2000, until completion of overhead construction work (approximately April 30, 2001). The barges will be craned into the water from the existing structure and removed from the completed replacement structure.

The new structure will be constructed of 64-foot pre-cast slabs craned into place. New abutments will be constructed landward of the existing abutments. Abutment construction will require steel-pipe pile (eight piles per abutment) and sheet pile driving. Concrete pier caps (including shear blocks), sidewalks, and bridge railings will be cast in place. Bridge roadways will have approximately 2-inches of asphalt concrete wearing surface (ACWS) placed over a waterproof membrane. All bridge joints will be sealed and stormwater directed via over-deck flow to bridge ends. In addition, the proposed actions will include various approach work. Any large woody material encountered during construction would be placed to the sides of the channel and not removed.

The City will assume responsibility for maintaining project plantings after termination of the construction contract (Greg Ausland, OBEC Consulting, personal communication, 9 November 2000).

B. First Avenue Bridge

The proposed 1st Avenue Bridge is 192 feet long, slightly longer than the existing structure (approximately 190 feet). Vibratory extraction of 48 wood piles will occur. The new abutments will be constructed above the bank line, landward of the existing abutments (Greg Ausland, OBEC Consulting, personal communication, 13 November 2000). Sheet pile will serve to isolate and contain concrete from flowing water during the abutment pour. Existing substrate material will be replaced to just below the sheet pile ledger beam. No riprap will be used.

Stormwater drainage will be collected at the west-end approach and piped to a vegetated river frontage bank [29,750 square feet (sf)], located south of the bridge approach (Greg Ausland, OBEC Consulting, personal communication, 17 November 2000). The drainage system collects runoff from approximately 10,200 sf of roadway. The existing grass sod slope will be removed and regraded to form a two-stepped bank. The new embankment will be planted with salal (*Gaultheria shallon*), swordfern (*Polystichum munitum*), False Lily of the Valley (*Maianthemum dilatatum*), False Solomon's Seal (*Smilacina racemosa*) groundcover, and vine maple (*Acer circinatum*) and western rhododendron (*Rhododendron macrophyllum*) clusters. The existing halophytic sedge (*Carex* spp.) meadow downslope of the designed embankment will not be disturbed. The two existing pine trees located onsite will be preserved. A river-run cobble energy dissipater [0.9 cubic yards (cy)] will be constructed at the drainage outfall. The submitted planting plan indicates tablet or *tea-bag* type fertilizers may be used.

As previously mentioned, the new structure will be approximately 12 feet wider than the existing. The increased bridge width will require modification of the existing boardwalks on both banks. Boardwalk modification is limited to partial removal of those portions in conflict with the new bridge, and reconstruction of out of water portions (i.e., landward segments of walkway and bridge deck and rail). Boardwalk materials include 2,200 board feet of ammoniacal copper zinc arsenate (ACZA) treated lumber.

Approach work includes the reconstruction of roadway pavers on the West-end approach and the installation of a dry well. The dry well is for future undetermined utility use (Greg Ausland, OBEC Consulting, personal communication, 13 November 2000), and is located approximately 65 feet from the edge of the active channel.

C. Twelfth Avenue Bridge

The proposed 12th Avenue Bridge is 210 feet long, 30 feet longer than the existing structure (approximately 180 feet). Vibratory extraction of 49 wood piles will occur. The new abutments will be constructed landward of the existing abutments. Sheet pile will be driven approximately 7 feet from the new abutment piles and to approximately 1 foot below the bent cap elevation. The concrete bent cap elevation is approximately 10 feet national geodetic vertical datum (NGVD) and above the ordinary high water mark (OHWM), approximately 8.7 feet.

Material will be excavated during removal of the existing abutment and class-200 riprap placed to form a 2:1 slope from the pile cap to the sheet pile ledger beam. Approximately 75 cy of material will be excavated from below the top of bank. Fill below the top of bank will consist of approximately 30 cy of concrete. Replacement of wood piles with steel-pipe piles will result in a 25 cy net reduction in piles within the channel.

Stormwater drainage will be collected at the East-end approach and piped to a 385 sf bioswale located south of the bridge approach. The drainage system collects runoff from approximately 12,400 sf of roadway. The bioswale will be seeded with native grasses and watered as necessary to assure plant survival. Project specifications (1032.45[d]) indicate the bioswale will be maintained free of non-native plants until termination of contract by hand-pulling, cutting, and/or spot application of herbicide.

A temporary utility support structure will be constructed across Neawanna Creek adjacent to the bridge alignment. The structure is necessary to allow continued use of a sewer line during bridge construction, and will require the driving of untreated pile. The sewer line will be relocated to the new bridge following construction and the temporary support structure removed.

Construction will require removal of approximately 20 cy of vegetation from below the OHWM. West and east side roadway shoulders above the top of bank will be widened and revegetated with native plants. All cleared areas will be replanted with native vegetation and monitored for success.

III. BIOLOGICAL INFORMATION AND CRITICAL HABITAT

Although there are currently limited data to assess population numbers or trends, NMFS believes that all coho salmon stocks comprising the OC coho salmon ESU are depressed relative to past abundance. The status and relevant biological information concerning OC coho salmon are well described in the proposed and final rules from the Federal Register (60 FR 38011, July 25, 1995; and 63 FR 42587, August 10, 1998, respectively), and Weitkamp *et al.* (1995).

Abundance of wild coho salmon spawners in Oregon coastal streams declined during the period from about 1965 to roughly 1975 and has fluctuated at a low level since that time (Nickelson *et al.* 1992). Spawning escapements for this ESU may be at less than 5 percent of abundance from that in the early 1900s. Contemporary production of coho salmon may be less than 10 percent of the historic production (Nickelson *et al.* 1992). Average spawner abundance has been relatively constant since the late 1970s, but preharvest abundance has declined. Average recruits-per-spawner may also be declining. The OC coho salmon ESU, although not at immediate danger of extinction, may become endangered in the future if present trends continue (Weitkamp *et al.* 1995).

Timing of adult coho salmon river entry is largely influenced by river flow. Coho salmon normally wait for fall freshets before entering rivers. In the Necanicum River watershed, adults return between mid-October and mid-January. OC coho salmon spawn in the Necanicum River basin between mid-

November and late-January with peak spawning occurring in late-November (Weitkamp *et al.* 1995). Neawanna Creek populations are believed to mirror those found in the Necanicum River. Juvenile coho salmon rear for one year in freshwater before migrating to the ocean. Coho salmon prefer cool water temperatures of 53⁰ to 58⁰ F, with 68⁰ F as maximum for rearing (Reeves *et al.* 1989). Spawning and juvenile rearing generally take place in small low gradient (generally less than 3 percent) tributary streams (Floyd 2000). Juvenile OC coho salmon migrate out of the Necanicum River basin as smolts between March and early-June.

Critical habitat for OC coho salmon includes Oregon coastal river basins (freshwater and estuarine areas) between Cape Blanco and the Columbia River. Freshwater critical habitat includes all waterways, substrates, and adjacent riparian areas below longstanding, natural impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) and several dams that block access to former coho salmon habitat. Riparian areas include areas adjacent to a stream that provide the following functions: shade, sediment, nutrient or chemical regulation, streambank stability, and input of large woody material (LWM) or organic matter. The proposed actions would occur in designated critical habitat for OC coho salmon.

IV. EVALUATING PROPOSED ACTIONS

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR Part 402 (the consultation regulations). In conducting analyses of habitat-altering actions under section 7 of the ESA, the NMFS uses the following steps: 1) Consider the status and biological requirements of the species; 2) evaluate the relevance of the environmental baseline in the action area to the species' current status; 3) determine the effects of the proposed or continuing action on the species; 4) consider cumulative effects; and 5) determine whether the proposed action, in light of the above factors, is likely to appreciably reduce the likelihood of species survival in the wild or adversely modify its critical habitat. In completing this step of the analysis, NMFS determines whether the action under consultation, together with all cumulative effects when added to the environmental baseline, is likely to jeopardize the continued existence of the listed species or result in destruction or adverse modification of critical habitat. If NMFS finds that the action is likely to jeopardize the listed species, NMFS must identify reasonable and prudent alternatives for the action.

A. Biological Requirements

The first step in the methods NMFS uses for applying the ESA section 7(a)(2) to listed salmon is to define the biological requirements of the species most relevant to each consultation. NMFS also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NMFS starts with the determinations made in its decision to list OC coho salmon under the ESA and also considers new data available that are relevant to the determination (Weitkamp *et al.* 1995).

The relevant biological requirements are those necessary for OC coho salmon to survive and recover to naturally reproducing population levels at which protection under the ESA will become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

For this consultation, the biological requirements are habitat characteristics that function to support successful rearing and migration. The current status of the OC coho salmon, based upon their risk of extinction, has not significantly improved since the species was listed and, in some cases, their status may have worsened.

B. Environmental Baseline

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species or its habitat and ecosystem within the action area. The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). Direct effects occur at the project site and may extend upstream or downstream based on the potential for impairing fish passage, hydraulics, sediment and pollutant discharge, and the extent of riparian habitat modifications. Indirect effects may occur throughout the watershed where actions described in this Opinion lead to additional activities or affect ecological functions contributing to stream degradation. For this consultation, the action area includes the affected streambed, bankline, adjacent riparian zone, and aquatic areas from the project site downstream to the mouth of the subject waterway, and upstream approximately 0.5 miles due to tidal influence.

The bulk of production for the OC coho salmon ESU is skewed to its southern portion where the coastal lake systems (e.g. Tenmile, Tahkenitch, and Siltcoos Basins) and the Coos and Coquille Rivers are more productive. The proposed action area is located in the northern half of the ESU where production is more depressed and habitat in the action area is underseeded. OC coho salmon are known to spawn in the Necanicum River and Neawanna Creek, and use the waterways for rearing.

Necanicum River

The Necanicum River is a small coastal river with a mainstem starting at the base of Humbug Mountain and traveling 21 miles to Seaside where it empties into the Pacific Ocean. Due to the geology of the basin and the shallow aquifer, the Necanicum River rises very quickly during storm events causing high velocity scouring.

The Necanicum River is highly channelized. Stream banks in the project area can be characterized as approximately 6.6 feet tall terraces stabilized by vegetation and riprap. Halophytic sedge species grow on the banks near the tidal zone of the river. The rest of the banks are dominated by non-native species.

Land use includes urban and rural residential, commercial, pasture, and logging. Lower reaches of the Necanicum River are tidal and heavily urbanized. The upper watershed has been logged and some large slides have occurred in the main basin. The Necanicum River is on the Oregon Department of Environmental Quality 303(d) list for water quality not meeting the bacteria criterion (ODEQ 2000).

Neawanna Creek

Neawanna Creek is a small coastal stream with headwaters in the local mountains southeast of the City of Seaside. The creek is approximately 5.4 miles long and drains the small watersheds immediately east of the city. Tributaries include Mill Creek, Thompson Creek, and Sunquist Creek. Flows are discharged into the Necanicum estuary.

In the subject reach, Neawanna Creek is slightly channelized, with stream banks stabilized by vegetation. Riprap is found only at the existing bridge footings. The eastern bank supports a small stand of conifers and hardwoods. The western bank is vegetatively sparse. Halophytic sedge species grow on the banks near the tidal zone of the river. Non-native species are dominate streambank vegetation.

Land use includes urban and rural residential, commercial, pasture, RV camping, and logging. Lower reaches of are tidal and heavily urbanized. The upper watersheds have been logged. Neawanna Creek is not listed on the Oregon Department of Environmental Quality 303(d) list for water quality (ODEQ 2000).

V. ANALYSIS OF EFFECTS

A. Effects of Proposed Actions

Project activities could affect juvenile and adult coho salmon present in the action area during and following construction. In the short term, pile extraction and driving may interfere with fish passage due to excessive aquatic noise and increases in turbidity. Turbidity may also impair fish health. The use of barges may increase the predation threat, primarily on juveniles. Long-term affects to fish health may result from suspension and subsequent deposition of sediments contaminated by creosote treated wood piles.

ODFW anticipates very few coho salmon will be present in the action area after January 1 (Joe Sheahan, ODFW, personal communication, 9 November 2000). All but late returning adults will have passed the subject reach for upstream spawning grounds by that date. Juvenile presence during the in-water work period will be limited to those individuals potentially displaced from upstream habitat due to winter high flows. Juveniles outmigrating from the systems during March to early-June, may experience behavioral effects while transiting the subject reach; however, the only in-water work authorized to occur during that time period is the removal of the temporary support structure.

Disturbance

Pile driving activities have the potential to delay adult migration and influence juvenile behavior. Salmonids can detect sound frequencies generated by pile driving within a radius of 300 meters (Feist 1992). Noise vibrations would likely cause fish to avoid the area. Other noises and the use of floodlights associated with construction activities could result in avoidance behavior.

Turbidity

Pile extraction and driving can adversely affect water quality due to suspension of sediments. An increase in turbidity can impact fish and filter-feeding macro-invertebrates downstream of the work site, as well as upstream on a flood tide. At moderate levels, turbidity has the potential to adversely affect primary and secondary productivity; at higher levels, turbidity may interfere with feeding and may injure and even kill both juvenile and adult fish (Spence *et al.* 1996, Berg and Northcote 1985).

Turbidity associated with the removal of the existing piles and placement of the new piles will be limited in duration and area. An anchored sediment barrier will be placed around pilings during extraction and driving when work is conducted in the wet. Regardless, turbidity may increase during the project's in-water work. Any increase in turbidity may impede the upstream movement of late returning adult coho salmon.

Transportation of terrestrial sediments to the waterways is also possible. Ground disturbance activities will expose and dislodge soils. Any precipitation during periods of vulnerability may result in erosion of soils and increases in stream turbidity if inadequate erosion control measures are implemented.

Hazardous Materials

Pile extraction may suspend and distribute contaminated sediments within the subject reaches. Exposure to PAH contaminated sediments leached from creosote piles may adversely affect aquatic organisms. PAH exposure has been associated with liver cancer, lesions, reproductive abnormalities, immune dysfunction, and alterations in growth and development in English sole (*Pleuronectes vetulus*) (Johnson 2000). Even short duration (days or weeks) PAH exposure may result in genetic damage (DNA adducts). Chronic exposure causes accumulation of DNA adducts in fish, which can be used to estimate the likelihood of PAH-related injury to transient residents of urban estuaries, such as migrating salmonids (Johnson 2000). NMFS has determined sediment concentrations of total PAHs above 1,000 ppb substantially increase risk to fish health (Johnson 2000). The use of sand collars around pile bases during extraction of wood piles should reduce suspension and exposure to contaminated sediments.

Stormwater collection and swale treatment constitute an improvement over the existing drainage system. Treatment areas were designed to accommodate anticipated runoff volumes, and a reduction of roadway contaminants to the waterways should result.

Similarly, as with all construction activities, accidental release of fuel, oil, and other contaminants may occur. Operation of pile drivers, cranes, backhoes, and other equipment requires the use of fuel,

lubricants, etc., which, if spilled into the channel of a water body or into the adjacent riparian zone, can injure or kill aquatic organisms. Petroleum-based contaminants (such as fuel, oil, and some hydraulic fluids) also contain PAHs, which can cause acute toxicity to salmonids at high levels of exposure and can also cause chronic lethal, as well as acute and chronic sublethal effects, to aquatic organisms (Neff 1985). No toxicants, including petroleum products, will be stored on the containment barges.

Herbicides used to clear vegetation may be used in riparian areas, where they may enter water bodies. Exposure to herbicides can have lethal and sublethal effects on salmonids, aquatic invertebrates, aquatic vegetation, as well as target and non-target riparian vegetation (Spence *et al.* 1996).

Predation

Barges will be used to prevent demolition debris and construction materials from inadvertently from entering the waterway. The barges will be located in water less than 20 feet deep and be onsite from December 15, 2000, until completion of overhead construction (approximately April 30, 2001).

The juvenile coho salmon outmigration occurs from March until early June. Barge presence during juvenile outmigration may result in elevated predation. Piscivorous birds may roost on barge edges, while predatory fish may hide in the shadow of the barges. To minimize impacts to migrating salmon, the barges will never span the entire channel at any one time.

B. Effects on Critical Habitat

The NMFS designates critical habitat based on physical and biological features that are essential to the listed species. Essential features of designated critical habitat include substrate, water quality, water quantity, water temperature, food, riparian vegetation, access, water velocity, space and safe passage. The proposed action area will occur within designated critical habitat for OC coho salmon.

The proposed actions will affect critical habitat. In the short term, a temporary increase of sediments and turbidity, and disturbance of riparian and in-stream habitat is expected. In the long term, a continuing loss of habitat function will occur where the riprap and sheet pile are placed; however, water quality may improve as a result of the collection and drainage of roadway runoff to water treatment swales.

While the use of riprap and sheet pile to protect bridge abutments will arguably result in an improvement over the existing vertical bulkheads, either structure prevents natural lateral channel movement at the site, and functions to simplify the channel and alter hydraulic processes (Spence *et al.* 1996). The subject bridges and related structures will continue to prevent natural streambank conditions from existing at the action site. However, NMFS does not expect that the net effect of this action will diminish the long-term value of the habitat for survival of OC coho salmon.

C. Interrelated and Interdependent Effects

Interrelated actions include actions that are part of a larger action and depend on the larger action for justification. Interdependent actions are defined as actions with no independent utility apart from the proposed action.

Associated with the proposed bridge replacements are several interdependent utility service actions. The actions do not represent a new level of service, or require new roads.

First Avenue Bridge

- Pacific Power and Light will abandon the existing power line before December 1st.
- NW Natural Gas will cap and abandon the existing gas line around December 15th. They plan to bore under the Necanicum River a few blocks away.
- The City of Seaside will cap the existing waterline and re-string on the new bridge.

Twelfth Avenue Bridge

- Pacific Power and Light will relocate the existing power pole at the northeast corner of the bridge before December 15th.
- Charter Communications will relocate the existing television line on the bridge to the new Pacific Power and Light power pole.
- NW Natural Gas will cap and abandon the existing gas line around December 15th. They have other tees and laterals in the area that provide gas.
- Qwest will relocate the overhead telephone line to the temporary utility support structure while bridge replacement activities are undertaken. Upon completion of the new bridge, Qwest will reattach the line to the bridge.
- The City of Seaside will relocate the sanitary sewer line to the temporary utility support structure during construction, and reattach to the new bridge following project completion.

Completion of these related actions may include excavation, vegetation alteration, and work above the waterway. While these related actions undertaken in association with the subject action may possess the potential to affect coho salmon or their habitat, the effects are not believed to constitute a new level of impact not already addressed in this consultation.

D. Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as those effects of "future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." Future Federal actions, including the ongoing operations are being, or have already been, reviewed through separate section 7 consultation processes. Therefore, these actions are not considered cumulative to the proposed action.

Other than the interdependent actions mentioned above, NMFS is not aware of any specific future non-Federal activities within the action area that will cause greater impacts to listed species than presently

occurs. NMFS assumes that future private and state actions will continue at similar intensities as in recent years.

VI. CONCLUSION

After reviewing the current status of OC coho salmon, the environmental baseline for the action areas, the effects of the proposed bridge replacement actions, the cumulative effects, and the interdependent effects, NMFS has determined that the City of Seaside's 1st Avenue and 12th Avenue Bridge Replacement Projects, as proposed, are not likely to jeopardize the continued existence of the OC coho salmon, and are not likely to destroy or adversely modify designated critical habitat. This finding is based, in part, on incorporation of best management practices (BMPs) as essential conservation components of the proposed actions.

VII. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. NMFS has no additional conservation recommendations regarding the action addressed in this Opinion.

VIII. REINITIATION OF CONSULTATION

This concludes formal consultation on these actions in accordance with 50 CFR 402.14(b)(1). Reinitiation of consultation is required: (1) If the action is modified in a way that causes an effect on the listed species that was not previously considered in the biological assessment and this Opinion; (2) new information or project monitoring reveals effects of the action that may affect the listed species in a way not previously considered; or (3) a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

IX. REFERENCES

Section 7(a)(2) of the ESA requires Opinions to be based on the best scientific and commercial data available. This section identifies the data used in developing this Opinion.

Berg, L. and T.G. Northcote. 1985. "*Changes In Territorial, Gill-Flaring, and Feeding Behavior in Juvenile Coho Salmon (Oncorhynchus kisutch) Following Short-Term Pulses of Suspended Sediment.*" Canadian Journal of Fisheries and Aquatic Sciences 42: 1410-1417.

- Feist, B.E. 1992. *Potential Impacts of Pile Driving on Juvenile Pink (Oncorhynchus gorbuscha) and Chum (O. keta) Salmon Behavior and Distribution*. University of Washington, School of Fisheries.
- Floyd, R. 2000. *ODOT Culvert Retrofit Research: Program analysis of fish passage through retrofitted culverts, Biological Assessment*. Oregon Department of Transportation, Salem, OR. May 25, 2000.
- Johnson, L. 2000. *An analysis of support of sediment quality thresholds for polycyclic aromatic hydrocarbons (PAHs) to protect estuarine fish*. National Marine Fisheries Service, Seattle, WA. July 24, 2000.
- Neff, J.M. 1985. *Polycyclic aromatic hydrocarbons*. In: Fundamentals of aquatic toxicology, G.M. Rand and S.R. Petrocelli, pp. 416-454. Hemisphere Publishing, Washington, D.C.
- Nickelson, T.E., J.W. Nicholas, A.M. McGie, R.B. Lindsay, D.L. Bottom, R.J. Kaiser, and S.E. Jacobs. 1992. *Status of anadromous salmonids in Oregon coastal basins*. Oregon Department of Fish and Wildlife, Research Development Section and Ocean Salmon Management, 83 p. Oregon Department of Fish and Wildlife, P.O. Box 59, Portland.
- Oregon Department of Environmental Quality (ODEQ). 2000. *Oregon's Final 1998 Water Quality Limited Streams - 303(d) List*. <<http://waterquality.deq.state.or.us>>. Accessed on November 17, 2000.
- Reeves, G.H., F.H. Everest, and T.E. Nickelson. 1989. *Identification of physical habitats limiting the production of coho salmon in western Oregon and Washington*. U.S. Forest Service Gen. Tech. Rep. PNW-GTR-245.
- Spence, B.C., G.A. Lomnický, R.M. Hughes, and R.P. Novitzki. 1996. *An ecosystem approach to salmonid conservation*. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, Oregon. (Available from the National Marine Fisheries Service, Portland, Oregon). 356 p.
- Weitkamp, L.A., T.C. Wainwright, G.J. Bryant, G.B. Milner, D.J. Teel, R.G. Kope, and R.S. Waples. 1995. *Status review of coho salmon from Washington, Oregon, and California*. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.

X. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered species and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Harm is further defined by the NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, and sheltering. Harass is defined by the NMFS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the term and conditions of this Incidental Take Statement.

A. Amount or Extent of Take

The NMFS anticipates that certain site-specific actions associated with the replacement of the existing bridges called for by the proposed action have more than a negligible likelihood of incidental take of OC coho salmon. Designated critical habitat for OC coho salmon may be adversely affected by project completion, but the negative effects are expected to be short term. The potential for take has been substantially reduced through the application of the BMPs. Therefore, even though the NMFS expects some low level of incidental take to occur due to the action covered by this Opinion, the best scientific and commercial data available are not sufficient to enable NMFS to estimate a specific amount of incidental take to the species itself. In instances such as this, the NMFS designates the expected level of take as unquantifiable. Based on the information provided, NMFS anticipates that an unquantifiable but low level of incidental take can occur as a result of the action covered by this Opinion. In the accompanying Opinion, the NMFS determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

B. Reasonable and Prudent Measures

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the City of Seaside, as appropriate, for the exemption on section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps: 1) Fails to assume and implement the terms and conditions; or 2) fails to require the City of Seaside to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. Activities that are not carried out consistent with the actions described in the Opinion (Section II - Proposed Action) or reasonable and prudent measures presented below will require further consultation. In order to monitor the impact of incidental take, the Corps shall report the progress of the action and its impact on the species to the NMFS as specified in the incidental take statement 50 CFR 402.14(i)(3).

The NMFS believes that the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of OC coho salmon from completion of the City of Seaside's 1st Avenue and 12th Avenue Bridge Replacement Projects on the Necanicum River and Neawanna Creek, respectively.

The Corps shall:

1. Minimize the likelihood of incidental take from construction activities in or near watercourses by requiring pollution and erosion control measures.
2. Minimize the likelihood of incidental take associated with impacts to riparian and in-stream habitats by requiring the avoidance or replacement of lost riparian and in-stream functions.
3. Minimize the likelihood of incidental take associated with in-stream work by restricting work to recommended in-water work periods.
4. Monitor the effectiveness of the proposed conservation measures in minimizing incidental take and report to NMFS.

C. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. To Implement Reasonable and Prudent Measure #1, above, the Corps shall ensure that:
 - a. Construction activities meet or exceed all requirements of the Oregon Department of Environmental Quality for the National Pollutant Discharge Elimination System (NPDES) 1200-CA permit.
 - b. A Pollution Control Plan (PCP) is developed to prevent point-source pollution related to construction operations that satisfies all pertinent requirements of Federal, State and Local laws and regulations, and the requirements of these conservation measures. The PCP will include the following:
 - i. A description of methods to be used to prevent erosion and sedimentation that covers sites, borrow pit operations, haul roads, equipment storage sites, fueling operations and staging areas;
 - ii. a description of the hazardous products or materials that will be used, including inventorying, storage, handling, and monitoring; and

- iii. a spill containment and control plan with notification procedures; specific clean up and disposal instructions for different products; quick response containment and clean up measures which will be available on site; proposed methods for disposal of spilled materials; and employee training for spill containment.
- c. All erosion control devices shall be inspected weekly, at a minimum, during construction to ensure that they are working adequately.
- d. Install all erosion and sediment control measures within 150 feet horizontal distance of the waterway prior to any other work in this area.
- e. Erosion control materials (i.e., silt fence, straw bales, biobags, aggregate, etc.) in excess of those installed shall be available on site for immediate use during emergency erosion control needs.
- f. Containment measures adequate to prevent construction and demolition materials from entering any waterway shall be implemented. Waterway shall be defined as that area below the mean high-high water elevation or 10-year flood elevation, whichever is greater.
- g. Steel coatings of the existing structure shall be considered to contain a red lead pigment primer, unless determined otherwise by laboratory findings. Treated timbers are also present on the existing structure. Comply with all relevant requirements of federal, state, and local regulations and requirements applicable to the disposal of contaminated materials.
- h. A turbidity curtain shall be used to contain suspended sediments during all pile removal and pile driving done in the wet.
- i. Prior to removal of treated-wood pile, a clean sand collar of 12 to 18 inches depth shall encircle the base of each pile.
- j. Existing piles shall be extracted. Piles that break during removal shall be cut below the streambed and covered to a minimum depth of 12 inches with clean sand.
- k. An oil absorbing, floating boom shall be available on-site during all phases of construction.
- l. Vehicles operated within 150 feet of the waterway shall be free of fluid leaks. Daily examination of vehicles for fluid leaks is required during periods operated within or above the waterway.

- m. No pollutants of any kind (sewage, waste spoils, petroleum products, fresh concrete cured less than 48 hours, silt, welding slag and grindings, concrete saw cutting by-products, sandblasting abrasive, etc.) shall come in contact with the waterbody or wetlands nor their substrate below the mean high-high water elevation or 10-year flood elevation, whichever is greater.
 - n. Any areas used for staging, access roads, or storage are to be evacuated and all materials, equipment, and fuel shall be removed if flooding of the area is expected to occur within 24 hours.
 - o. Vehicle maintenance, re-fueling of vehicles and storage of fuel shall be done at least 150 feet from the waterway.
 - p. At the end of each work shift, vehicles shall not be stored within or over the waterway.
 - q. Prior to operating within the waterway, all equipment shall be cleaned of external oil, grease, dirt or caked mud. Any washing of equipment shall be conducted greater than 150 feet from the waterway and in a location that shall not contribute untreated wastewater to any flowing stream.
 - r. No preboring or jetting shall occur without prior toxicity testing of the sediments.
 - s. No surface application of fertilizer shall be permitted within 50 feet of the waterway.
 - t. No herbicide application shall occur as part of this project. Mechanical removal of undesired vegetation and root nodes is permitted.
 - u. Temporary erosion and sediment controls will be used on all exposed slopes during any hiatus in work exceeding 7 days.
 - v. Exposed soil surfaces will be permanently stabilized at finished grade with native grass seeding and mulch prior to September 15, 2001.
2. To implement Reasonable and Prudent Measure #2, above, the Corps shall ensure that:
- a. The Engineer shall identify and mark the clearing limits. Do not begin construction activity or move equipment into existing vegetated areas until clearing limits are marked.
 - b. Material removed during excavation will only be placed in locations where it cannot enter sensitive aquatic resources. Whenever topsoil is removed, it will be stored and reused onsite to the greatest extent possible.

- c. Alteration or disturbance of the stream banks and existing riparian vegetation will be minimized to the greatest extent possible.
 - d. All existing vegetation within 150 feet of the edge of bank should be retained to the greatest extent possible.
 - e. Plantings shall achieve an 80 percent survival success after three years.
 - f. Plantings shall use only native species.
 - g. During the establishment period of planted areas, control invasive, non-native plants, including Himalayan blackberry (*Rubus discolor*), Canada thistle (*Cirsium arvense*), teasel (*Dipsacus sylvestris*), and reed canary grass (*Phalaris arundinacea*), by hand pulling and/or cutting prior to going to seed.
3. To implement Reasonable and Prudent Measure #3, above, the Corps shall ensure that:
- a. The applicant will arrange a pre-work meeting with ODFW (Joe Sheahan, 503-338-0106) and the contractor prior to commencement of project activities.
 - b. Survey and mark the mean high-high water elevation or 10-year flood elevation, whichever is greater, prior to construction to delineate the in-water work area.
 - c. All in-water work shall be completed within the work period of January 1 and February 15. In-water work includes, but is not limited to:
 - i. Removal of existing bridge.
 - ii. Removal of existing bridge piles.
 - iii. Driving new bridge piling including sheet pile.
 - iv. Driving temporary utility support structure piles at 12th Avenue Bridge.
 - d. No in-water work shall take place outside this period without prior written authorization from the Corps (in consultation with ODFW and NMFS), except pile removal for the temporary utility support structure at 12th Avenue.
 - e. Temporary utility support structure pile removal at 12th Avenue shall occur prior to May 25, 2001 under the following conditions:
 - i. The temporary utility support piling is removed from either the new bridge or by in-creek manpower during periods of no active flowing water.
 - ii. The Engineer and contractor contact NMFS (Rob Markle, 503-230-5419) or ODFW (Joe Sheahan, 503-338-0106) prior to commencing removal activities to confirm intended methods and timing.

4. To Implement Reasonable and Prudent Measure #4, above, the Corps shall:
- a. Provide NMFS with a report describing the success of conservation measures, confirmation of as-built design, and planting success. The report will be submitted as outlined below.
 - b. *Construction.* The report on the conservation measures and as-built component of monitoring will be provided by July 1, 2001, and include a description of:
 - i. Specific methods actually used to contain turbidity, including details of turbidity curtain deployment and sand collars;
 - ii. Stream conditions prior to and following placement and removal of curtains;
 - iii. Any problems experienced with containment measures and turbidity curtains;
 - iv. Pile extraction success, including number of piles snapped and buried during extraction; and
 - v. Any mortality of fish resulting from project activities.
 - c. *Revegetation.* This component of the monitoring report, including photo documentation, will be provided by December 31, 2004, and focus on actions taken to ensure that plantings were done correctly and success at meeting the objective of 80 percent or higher survival rate after three years;
 - d. Monitoring reports will be submitted to:

Oregon Branch Chief National Marine Fisheries Service 525 NE Oregon Street, #500 Portland, Oregon 97232-2737	Oregon Department of Fish and Game Attn: Joe Sheahan Astoria Field Office Room 101 2021 Marine Drive Astoria, OR 97103
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Refer to: OSB2000-0289
 - e. If a dead, sick or injured Oregon Coast coho salmon is located, immediate notification must be made to Rob Markle, NMFS, telephone: (503) 230-5419, or Joe Sheahan, ODFW, telephone: (503) 338-0106. Care will be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured species or preservation of biological material from a dead animal, the finder has the responsibility to carry out instruction provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

XI. ESSENTIAL FISH HABITAT CONSULTATION

A. Background

The objective of the Essential Fish Habitat (EFH) consultation is to determine whether the proposed action may adversely affect designated EFH for relevant species, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse impacts to EFH resulting from the proposed action.

B. Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NMFS on activities that may adversely affect EFH.

EFH means “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (MSA §3). The Pacific Fisheries Management Council (PFMC) has designated EFH for federally-managed groundfish (PFMC 1998a), coastal pelagic (PFMC 1998b), and Pacific salmon (PFMC 1999) fisheries (Table 1).

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NMFS is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

The consultation requirements of section 305(b) of the MSA (16 U.S.C. 1855(b)) provide that:

- Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;
- NMFS shall provide conservation recommendations for any Federal or State activity that may adversely affect EFH;
- Federal agencies shall within 30 days after receiving conservation recommendations from NMFS provide a detailed response in writing to NMFS regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NMFS, the Federal agency shall explain its reasons for not following the recommendations.

C. Identification of Essential Fish Habitat

Groundfish and coastal pelagic EFH extend from tidal submerged environments within Washington, Oregon, and California offshore to the exclusive economic zone limit (200 mi) (PFMC 1998a; PFMC 1998b). A description and identification of EFH for salmon is found in Appendix A of Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Salmon EFH includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon in Washington, Oregon, Idaho, and California, except above the impassable barriers identified by the Council (PFMC 1999). Chief Joseph Dam, Dworshak Dam, and the Hells Canyon Complex (Hells Canyon, Oxbow, and Brownlee Dams) are among the listed man-made barriers that represent the upstream extent of the Pacific salmon fishery EFH. Salmon EFH excludes areas upstream of longstanding naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years). In the estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (200 mi) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border (PFMC 1999).

D. Proposed Actions

The proposed actions are detailed above in *Section II*. The action area encompasses the areas immediately associated with the subject bridge crossings on the Necanicum River (1st Avenue) and Neawanna Creek (12th Avenue), as well as points downstream and upstream (tidal influence) that may experience increased turbidity or contaminated waters.

E. Effects of the Proposed Actions

As described in *Section V*, these activities may result in detrimental short- and long-term impacts to a variety of habitat parameters. Potential PAH contamination is of particular concern in light of possible long-term exposure to benthic resident groundfish found in the estuarine waters of the action area. The effects of PAH exposure on English sole have been well documented and include liver cancer, lesions, reproductive abnormalities, immune dysfunction, and alterations in growth and development (Johnson 2000).

F. Conclusion

The NMFS believes that the proposed action may adversely affect designated EFH for the groundfish, coastal pelagic, and Pacific salmon (chinook and coho).

G. EFH Conservation Recommendations

The Reasonable and Prudent Measures and the Terms and Conditions outlined above in *Section X* are applicable to designated groundfish, coastal pelagic, and Pacific salmon EFH. Therefore, NMFS recommends that they be adopted as EFH conservation measures. Should the Corps adopt and implement these recommendations, potential adverse impacts to EFH would be minimized.

H. Statutory Requirements

The MSA and Federal regulation (50 CFR Section 600.920) require Federal action agencies to provide a written response to EFH Conservation Recommendations within 30 days of receipt. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity. If the response is inconsistent with NMFS' conservation recommendations, the reasons for not implementing them must be included.

In the case of the actions currently under consultation, the recommendations constitute non-discretionary Terms and Conditions of the Opinion, and as such, the projects may not be carried out without their implementation. Therefore, NMFS assumes the Corps will accept these recommendations and further response by the Corp is not necessary. However, if the Corps does not agree with these recommendations, the Corps must respond and provide an explanation of the reasons for not implementing them.

I. Consultation Renewal

The Corps must reinitiate EFH consultation with NMFS if either action is substantially revised or new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920).

Table 1. Species with designated EFH found in waters of the State of Oregon.¹

Ground Fish Species	Blue rockfish (<i>S. mystinus</i>)	Rougheye rockfish (<i>S. aleutianus</i>)	Flathead sole (<i>Hippoglossoides elassodon</i>)
Leopard shark (<i>Triakis semifasciata</i>)	Bocaccio (<i>S. paucispinis</i>)	Sharpchin rockfish (<i>S. zacentrus</i>)	Pacific sanddab (<i>Citharichthys sordidus</i>)
Soupfin shark (<i>Galeorhinus zyopterus</i>)	Brown rockfish (<i>S. auriculatus</i>)	Shortbelly rockfish (<i>S. jordani</i>)	Petrale sole (<i>Eopsetta jordani</i>)
Spiny dogfish (<i>Squalus acanthias</i>)	Canary rockfish (<i>S. pinniger</i>)	Shorttraker rockfish (<i>S. borealis</i>)	Rex sole (<i>Glyptocephalus zachirus</i>)
Big skate (<i>Raja binoculata</i>)	Chilipepper (<i>S. goodei</i>)	Silvergray rockfish (<i>S. brevispinus</i>)	Rock sole (<i>Lepidopsetta bilineata</i>)
California skate (<i>R. inornata</i>)	China rockfish (<i>S. nebulosus</i>)	Speckled rockfish (<i>S. ovalis</i>)	Sand sole (<i>Psettichthys melanostictus</i>)
Longnose skate (<i>R. rhina</i>)	Copper rockfish (<i>S. caurinus</i>)	Splitnose rockfish (<i>S. diploproa</i>)	Starry flounder (<i>Platyichthys stellatus</i>)
Ratfish (<i>Hydrolagus colliei</i>)	Darkblotched rockfish (<i>S. crameri</i>)	Stripetail rockfish (<i>S. saxicola</i>)	
Pacific rattail (<i>Coryphaenoides acrolepis</i>)	Grass rockfish (<i>S. rastrelliger</i>)	Tiger rockfish (<i>S. nigrocinctus</i>)	Coastal Pelagic Species
Lingcod (<i>Ophiodon elongatus</i>)	Greenspotted rockfish (<i>S. chlorostictus</i>)	Vermillion rockfish (<i>S. miniatus</i>)	Northern anchovy (<i>Engraulis mordax</i>)
Cabezon (<i>Scorpaenichthys marmoratus</i>)	Greenstriped rockfish (<i>S. elongatus</i>)	Widow Rockfish (<i>S. entomelas</i>)	Pacific sardine (<i>Sardinops sagax</i>)
Kelp greenling (<i>Hexagrammos decagrammus</i>)	Longspine thornyhead (<i>Sebastolobus altivelis</i>)	Yelloweye rockfish (<i>S. ruberrimus</i>)	Pacific mackerel (<i>Scomber japonicus</i>)
Pacific cod (<i>Gadus macrocephalus</i>)	Shortspine thornyhead (<i>Sebastolobus alascanus</i>)	Yellowmouth rockfish (<i>S. reedi</i>)	Jack mackerel (<i>Trachurus symmetricus</i>)
Pacific whiting (Hake) (<i>Merluccius productus</i>)	Pacific Ocean perch (<i>S. alutus</i>)	Yellowtail rockfish (<i>S. flavidus</i>)	Market squid (<i>Loligo opalescens</i>)
Sablefish (<i>Anoplopoma fimbria</i>)	Quillback rockfish (<i>S. maliger</i>)	Arrowtooth flounder (<i>Atheresthes stomias</i>)	
Aurora rockfish (<i>Sebastes aurora</i>)	Redbanded rockfish (<i>S. babcocki</i>)	Butter sole (<i>Isopsetta isolepsis</i>)	Salmon
Bank Rockfish (<i>S. rufus</i>)	Redstripe rockfish (<i>S. proriger</i>)	Curlfin sole (<i>Pleuronichthys decurrens</i>)	Coho salmon (<i>O. kisutch</i>)
Black rockfish (<i>S. melanops</i>)	Rosethorn rockfish (<i>S. helvomaculatus</i>)	Dover sole (<i>Microstomus pacificus</i>)	Chinook salmon (<i>O. tshawytscha</i>)
Blackgill rockfish (<i>S. melanostomus</i>)	Rosy rockfish (<i>S. rosaceus</i>)	English sole (<i>Parophrys vetulus</i>)	

¹ From Casillas *et al* 1998, Dees 1961, Emmett *et al.* 1991, Eschmeyer *et al.* 1983, Fields 1965, Gotshall 1977, Hart 1973, Healey 1991, Miller and Lea 1972, Monaco *et al.* 1990, Phillips 1957, Phillips 1964, Roedel 1948, Roedel 1953, Sandercock 1991, Turner and Sexsmith 1967, and Walford 1931.

J. References

- Casillas, E., L. Crockett, Y. deReynier, J. Glock, M. Helvey, B. Meyer, C. Schmitt, M. Yoklavich, A. Bailey, B. Chao, B. Johnson and T. Pepperell. 1988. *Essential Fish Habitat West Coast Groundfish Appendix*. National Marine Fisheries Service. Montlake, Washington. 778 p.
- Dees, L.T. 1961. *Cephalopds: cuttlefish, octopuses, squids*. U.S. Department of the Interior, Bureau of Commercial Fisheries. Fishery Leaflet 524. 10 p.
- Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. *Distribution and abundance of fishes and invertebrates in west coast estuaries, Volume II: species life history summaries*. ELMR Report No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD. 329 p.
- Eschmeyer, W.N., E. S. Herald, and H. Hamman. 1983. *A field guide to Pacific coast fishes of North America*. Houghton Mifflin Company. Boston, Mass. 336 p.
- Fields, W.G. 1965. *The structure, development, food relations, reproduction and life history of the squid (Loligo opalescens Berry)*. California Department of Fish and Game. Fish Bulletin 131. 108 p.
- Gotshall, D. W. 1977. *Fishwatchers' guide to the inshore fishes of the Pacific coast*. Sea Challengers. Monterey, California. 108 p.
- Hart, J. L. 1973. Pacific fishes of Canada. *Fisheries Research Board of Canada*. Bulletin 180. 740 p.
- Healey, M.C. 1991. *Life history of chinook salmon (Oncorhynchus tshawytscha)*. Pages 311-393 In: Groot, C. and L. Margolis (eds.). 1991. Pacific salmon life histories. Vancouver, British Columbia: University of British Columbia Press.
- Miller, D.J. and R. N. Lea. 1972. *Guide to the coastal marine fishes of California*. California Department of Fish and Game. Fish Bulletin Number 157. 249 p.
- Monaco, M.E., D.M. Nelson, R.L. Emmett, and S.A. Hinton. 1990. *Distribution and Abundance of fishes and invertebrates in west coast estuaries, Volume 1, Data summaries*. ELMR Report No. 4. Strategic assessment Branch, NOS/NOAA. Rockville, MD. 240 p.
- PFMC (Pacific Fishery Management Council), 1998a. *Final Environmental Assessment/Regulatory Review for Amendment 11 to the Pacific Coast Groundfish Fishery Management Plan*. October 1998.

- PFMC (Pacific Fishery Management Council), 1998b. *The Coastal Pelagic Species Fishery Management Plan: Amendment 8*. December 1998.
- PFMC (Pacific Fishery Management Council). 1999. *Amendment 14 to the Pacific Coast Salmon Plan*. Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Portland, Oregon.
- Phillips, J. B. 1957. *A review of the rockfishes of California*. California Department of Fish and Game. Fish Bulletin 104. 158 p.
- Phillips, J.B. 1964. *Life history studies on ten species of rockfish*. California Department of Fish and Game. Fish Bulletin 126. 70 p.
- Roedel, P.M. 1948. *Common marine fishes of California*. California Department of fish and Game. Fish Bulletin 68. 153 p.
- Roedel, P.M. 1953. *Common ocean fishes of the California coast*. California Department of Fish and Game. Fish Bulletin 91. 184 p.
- Sandercock, F.K. 1991. *Life history of coho salmon (Oncorhynchus kisutch)*. Pages 395-445 In: Groot, C. and L. Margolis (eds.). 1991. *Pacific salmon life histories*. Vancouver, British Columbia: University of British Columbia Press.
- Turner C.H. and J. C. Sexsmith. 1967. *Marine baits of California*. California Department of Fish and Game. Sacramento, California. 71 p.
- Walford, L.A. 1931. *Handbook of common commercial and game fishes of California*. California Division of Fish and Game, Bureau of Commercial Fisheries. Fish Bulletin 28. 182 p.